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#9

PATENT
2927-0103P

IN THE U.S.PATNT AND TRADEMARK OFFICE

Applicant: Norio Sumitomo et al.
Appl.No: 09/295,273 Group: 2927-0103P
Filed: April 20, 1999 Examiner: S.Varma
For: GOLF CLUB SHAFT

DECLARATION OF HIDEAKI KAWAMATSU

Honorable Commissioner of Patent and Trademarks
Washington D.C. 20231

Sir:

I, Hideaki Kawamatsu, a citizen of Japan, residing at 3-7-14, Isoshi, Takarazuka-shi, Hyougo-ken, Japan do hereby declare and say:

1. That I am Inventor of Patent Number 5,421,573.

I graduated from Kyoto University, Kyoto Prefecture, Japan in March 1986 with the degree of Bachelor of faculty of Physical engineering.

Since April 1986 up to present, I have joined Sumitomo Rubber Industries, Itd. Kobe, Japan and have been engaged in research and development of sport instrument such as golf club shaft, golf ball and method of measurement of the golf club shaft and golf ball.

I invented a golf club shaft with respect of Appl.No.66,241 and obtained Patent Number 5,421,573.

2. I read the rejection issued on 3/21/01 with respect to the

application serial No.09/295,273, and the reference of my invention cited therein in the above identified application.

3. I beg to submit herein the exact report of my invention on experiment carried out to demonstrate the difference between the golf club shaft of cited my invention and the golf club shaft of the present invention.

In the golf club shaft of the invention disclosed in Patent No.5421573, inclined fiber reinforced resinous layer 6a and 6b shown in Fig. 2 are rectangular, and the tip and the butt thereof in its longitudinal direction have the equal width.

The diameter of the golf club shaft becomes smaller toward the tip, whereas the width of the inclined fiber reinforced resinous layer is constant. Therefore the number of turns (number of plies) of the inclined fiber reinforced resinous layer increases toward the tip and decreases toward the butt. That is, the golf club shaft has different number of plies at its respective positions in its longitudinal direction (its axial direction).

The width of inclined fiber reinforced resinous layers 6a and 6b shown in Fig. 8 becomes gradually larger toward the tip having the smaller diameter and becomes gradually smaller toward the butt having the larger diameter. That is, inclined fiber reinforced resinous layers 6a and 6b are

trapezoidal. In this case, the number of plies increases gradually from the tip to the butt. That is, the golf club shaft has different number of plies at respective positions in its longitudinal direction (its axial direction).

The inclined fiber reinforced resinous layers shown in Figs. 9 and 10 has a constant width from the tip to the vicinity of the butt and has a smaller width in the neighborhood of the butt. Thus the number of plies decreases gradually in the constant-width region and becomes much smaller in the narrow-width region in the neighborhood of the butt.

That is, in the inclined fiber reinforced resinous layers 6a and 6b of the golf club shaft of the invention disclosed in Patent No.5421573, the number of plies is not constant in the entire length thereof. The number of plies at the tip, the butt, and respective positions therebetween are different from one another. That is, the number of plies is different at respective positions in the axial direction of the golf club shaft.

As shown in Fig. 11, in the conventional golf club shaft, the inclined fiber reinforced resinous layer becomes narrower toward the tip, whereas it becomes wider toward the butt. That is, the inclined fiber reinforced resinous layer is trapezoidal. The number of plies is integral, namely, one or two in the whole length of the golf club shaft.

That is, a golf club shaft having an unintegral number of turns of the bias layer has not been provided.

On the other hand, as described in the specification of the present invention and shown in the drawing, the width of each of inclined fiber reinforced resinous layers is determined in correspondence to an unintegral number of turns of the inclined fiber reinforced resinous layer respectively. More specifically, as shown in Fig. 1, the prepreg 1a of the inclined fiber reinforced resinous layer of the first embodiment has the width corresponding to 3.3 plies, and as shown in Fig. 3, the prepregs 3a - 3d of the inclined fiber reinforced resinous layer of the second embodiment has the width corresponding to 1.5 plies.

Each of the inclined fiber reinforced resinous layers of the first and second embodiments is disposed in the entire length of the golf club shaft. Thus in the golf club shaft, the inclined fiber reinforced resinous layer is wound in the same number of plies in its entire length in its axial direction.

As described above, the golf club shaft of the invention disclosed in Patent No.5421573 has different number of plies of the inclined fiber reinforced resinous layer at respective positions in its axial direction. On the other hand, according to the present invention, the number of plies of the inclined fiber reinforced resinous

layer wound is constantly unintegral in the axial direction of the golf club shaft. That is, the number of plies of the inclined fiber reinforced resinous layer is constant at respective positions of the golf club shaft in its axial direction.

Therefore, the construction of the golf club shaft of the patent disclosed in Patent No.5421573 is fundamentally different from that of the golf club shaft of the present invention.

Based on the difference in the constructions of both golf club shafts, the operation of the golf club shaft of the present invention is that because the inclined fiber reinforced resinous layer is wound at an unintegral number of times, it is curved when it is swung and it generates a twist in consequence of the curve. On the other hand, the golf club shaft of Patent No.5421573 does not twist.

That is, the golf club shaft of Patent No.5421573 is not so constructed as to generate twists. On the other hand, the present invention is characterized in that the golf club shaft twists.

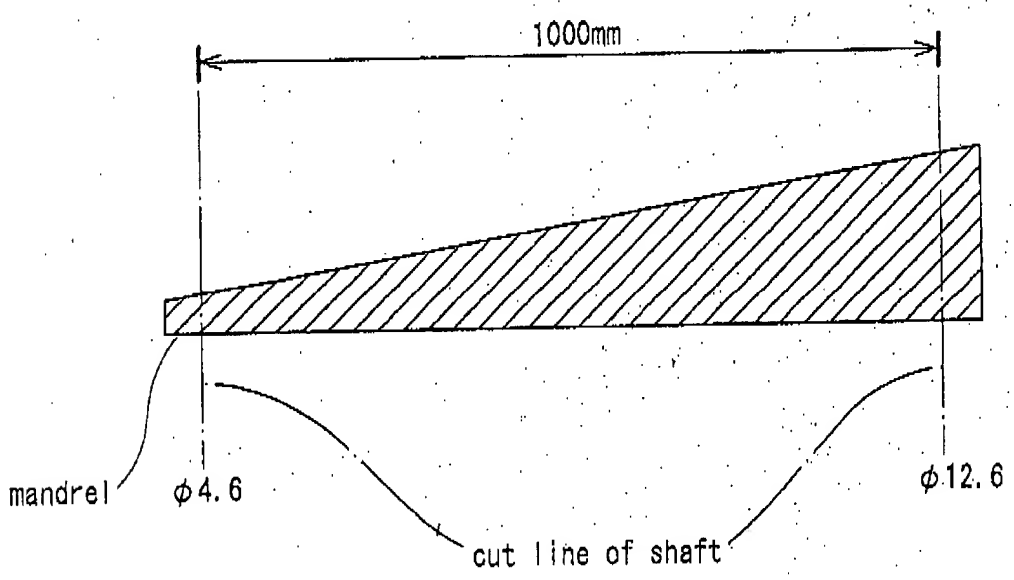
It prepared a trial shaft having the construction of the invention of Patent No.5421573 and a trial shaft having the construction of the present invention as trial products to inspect the degree of twists thereof.

The trial shaft of Patent No.5421573 is denoted as

KPAT-9 below. The trial shaft of the present invention is denoted as KPAT-7 below. The trial shafts were formed in conformity to the specification shown in trial design tables 1 and 2.

In accordance with the description of Patent No.5421573, both the trial shafts KPAT-9 and KPAT-7 had a length of 1000mm, a prepreg width of 60 - 70mm, and were made of a prepreg reinforced with carbon fiber. Number of trial products of KPAT-9 were four, and number of trial products of KPAT-7 were two.

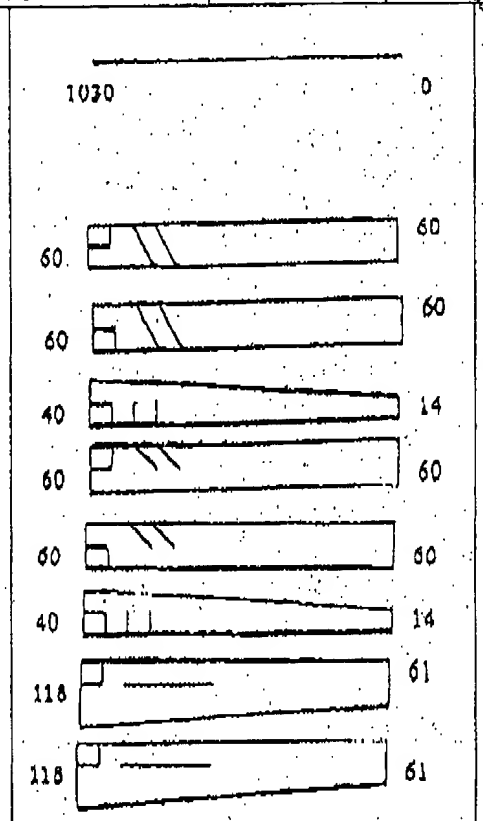
The prepreg of KPAT-7 and KPAT-9 were wound on a mandrel as shown as below, accordance with description of Patent No. 5421573.

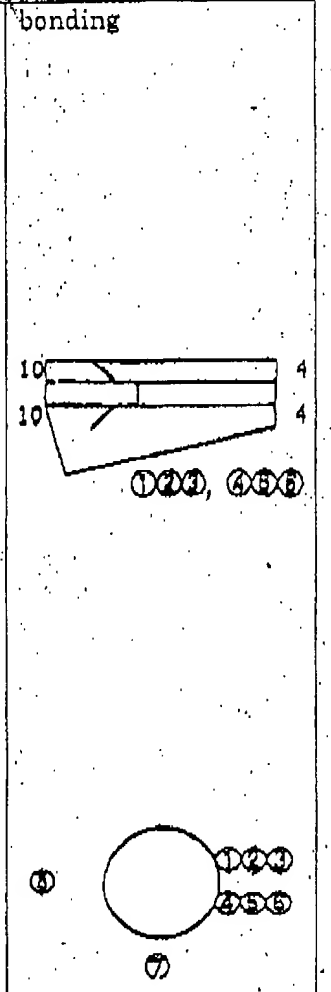


TRIAL DESIGN TABLE (1)

golf shaft		No.	KPAT-9
Mandrel No. K30		Date	August 23, 2001
Patent No. 5421573		Number	two

No.	Prepreg number	Angle
		0
①	M46J	-45
②	〃	+45
③	805S-3	90
④	M46J	-45
⑤	〃	+45
⑥	805S-3	90
⑦	T300	0
⑧	T300	0



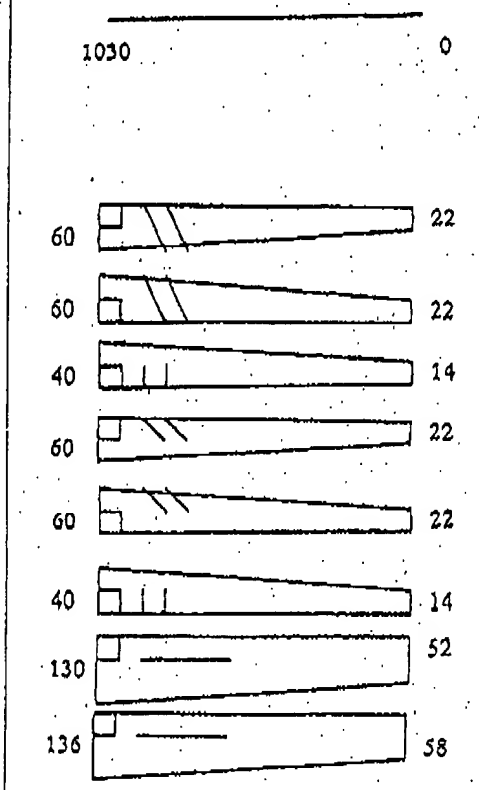


cutting	front end 17±2mm 1000mm
polishing of end	not done
entire polishing	1.5g

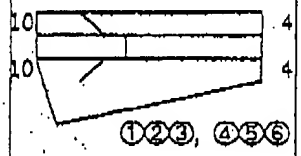
TRIAL DESIGN TABLE (2)

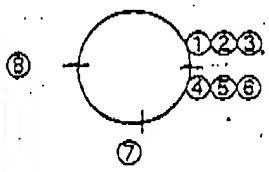
golf shaft		No.	KPAT-7
Mandrel No. K30		Date	August 23, 2001
Patent No. 5421573		Number	four

No	Prepreg number	Angle
		0
①	M46J	-45
②	〃	+45
③	805S-3	90
④	M46J	-45
⑤	〃	+45
⑥	805S-3	90
⑦	T300	0
⑧	T300	0



bonding





cutting	front end 17±2mm 1000mm
polishing of end	not done
entire polishing	1.5g

The number of plies at respective position of the inclined fiber reinforced resinous layer in the axial direction of the trial shaft are as shown in a table 3 (KPAT-9) and a table 4 (KPAT-7). The section of each position is as shown in Fig. 1 (KPAT-9) and in Fig. 2 (KPAT-7) of separate papers.

Inclined layer

Table 3 (KPAT9)

front end	【mm】	0	250	500	750	1000
diameter	【mm】	4.6	6.6	8.6	10.6	12.6
Length of ply	【mm】	14.4	20.7	27.0	33.3	39.6
Width of prepreg	【mm】	60.0	60.0	60.0	60.0	60.0
Number of wound plies	【ply】	4.2	2.9	2.2	1.8	1.8

Table 4 (KPAT7)

front end	【mm】	0	250	500	750	1000
diameter	【mm】	4.6	6.6	8.6	10.6	12.6
Length of ply	【mm】	14.4	20.7	27.0	33.3	39.6
Width of prepreg	【mm】	22.0	31.5	41.0	50.5	60.0
Number of wound plies	【ply】	1.5	1.5	1.5	1.5	1.5

As shown in Fig. 1, in the trial shaft KPAT-9 of the invention of Patent No.5421573, the number of plies of the inclined fiber reinforced resinous layer at positions spaced at 0mm, 250mm, 50mm, 750mm, and 1000mm from the tip are different from one another.

On the other hand, as shown in Fig. 2, in the trial shaft KPAT-7 of the present invention, the number of plies

of the inclined fiber reinforced resinous layer is constant at the respective positions.

The number of plies of the straight layer at the respective positions of both trail shafts in its axial direction is shown in table 5 (KPAT-9) and a table 6 (KPAT-7).

straight layer

Table 5 (KPAT9)

front end	【mm】	0	250	500	750	1000
diameter	【mm】	4.6	6.6	8.6	10.6	12.6
Length of ply	【mm】	14.4	20.7	27.0	33.3	39.6
Width of prepreg	【mm】	61.0	75.3	89.5	103.8	118.0
Number of wound plies	【ply】	4.2	3.8	3.3	3.1	3.0

Table 6 (KPAT7)

front end	【mm】	0	250	500	750	1000
diameter	【mm】	5.6	7.8	9.8	11.8	13.8
Length of ply	【mm】	18.2	24.5	30.8	37.1	43.3
Width of prepreg	【mm】	55.0	73.8	92.5	111.3	130.0
Number of wound plies	【ply】	3.0	3.0	3.0	3.0	3.0

The twist amount in bending of the four trial shafts KPAT-9 of Patent No.5421573 and that of the two trial shaft KPAT-7 of the present invention were measured, as shown with photographs of a separate sheet. The twist amounts in bending of both trial shafts ware measured by the measuring method shown in Fig. 12 of the present invention.

Table 7 shows the measured results.

Table 7

twist amounts

KPAT-7 (1)	0.51mm
KPAT-7 (2)	0.32mm
KPAT-7 (3)	0.34mm
KPAT-7 (4)	0.57mm
average of four products	0.44mm
KPAT-9 (1)	-0.04mm
KPAT-9 (2)	-0.04mm
average of two products	-0.04mm

As shown in table 7, the twist amount in bending of the trial shaft KPAT-9 of Patent No.5421573 is almost zero, namely, -0.04mm which is torerance. It was confirmed that the shaft was not curved and thus not twisted. On the other hand, the trial shaft KPAT-7 of the present invention twisted in an amount of 0.44mm as the average value of four-time experiments. It was confirmed that the trial shaft KPAT-7 of the present invention has the characteristic that it twists in consequence of the curve.

As apparent from the foregoing description, there is a difference between the construction of the golf club shaft of the invention of Patent No.5421573 and that of the golf club shaft of the present invention. Based on the construction, the golf club shaft of the present invention curves and twists. On the other hand, because the golf club shaft of the invention of Patent No.5421573 is not so constructed as to curve and twist, it does not curve or twist.

In conclusion, I report that those skilled in the art could not have easily made the present invention on the basis of my invention disclosed in Patent No.5421573.

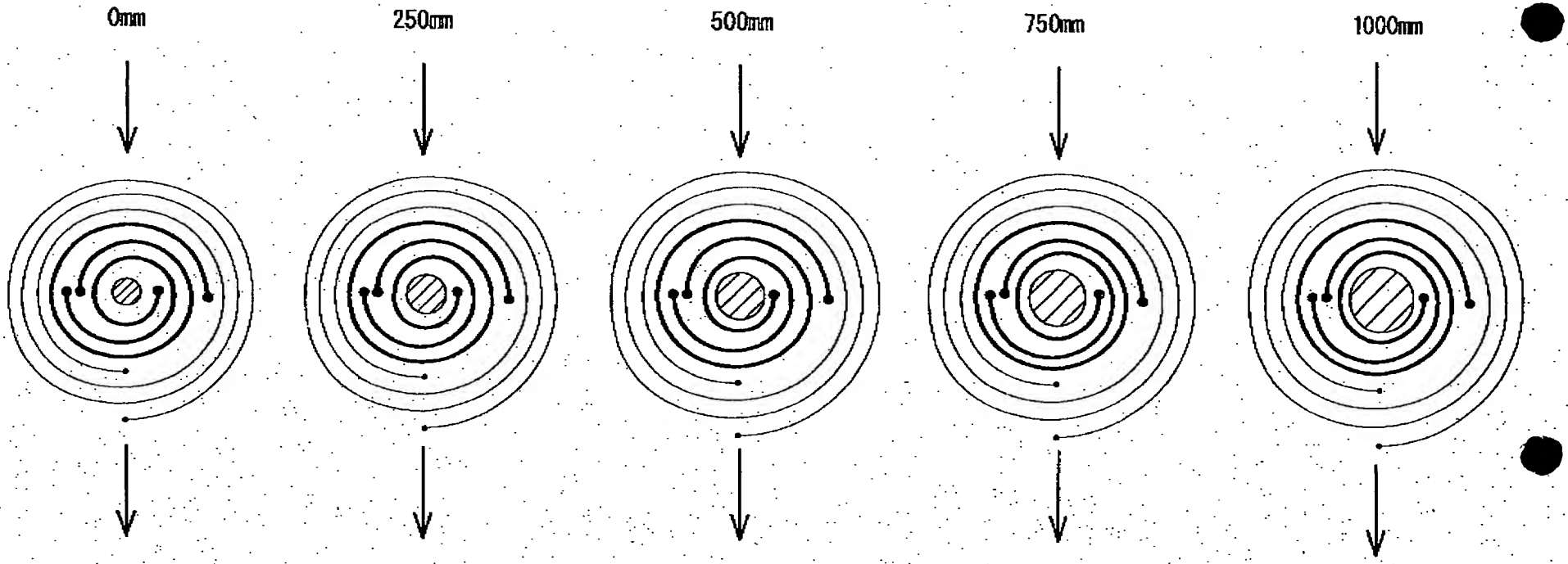
I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Dated this 20th day of September, 2001

Hideaki Kawamatsu

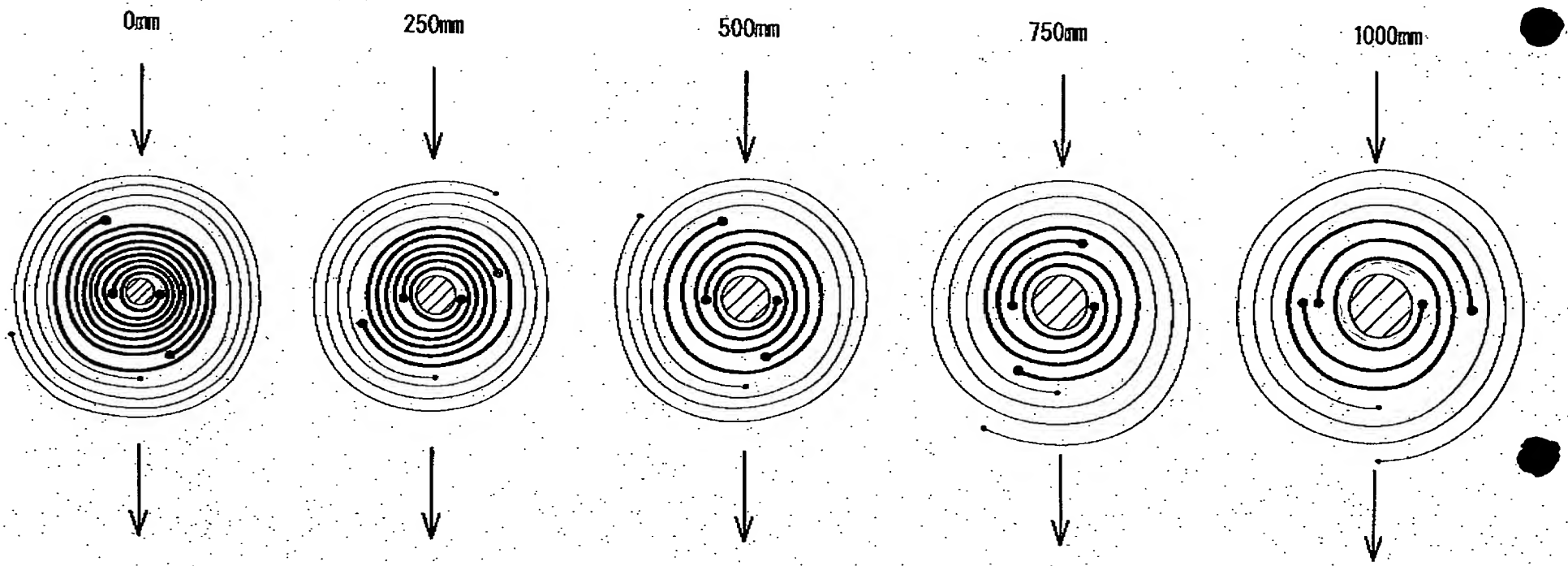
Hideaki Kawamatsu

Fig. 1



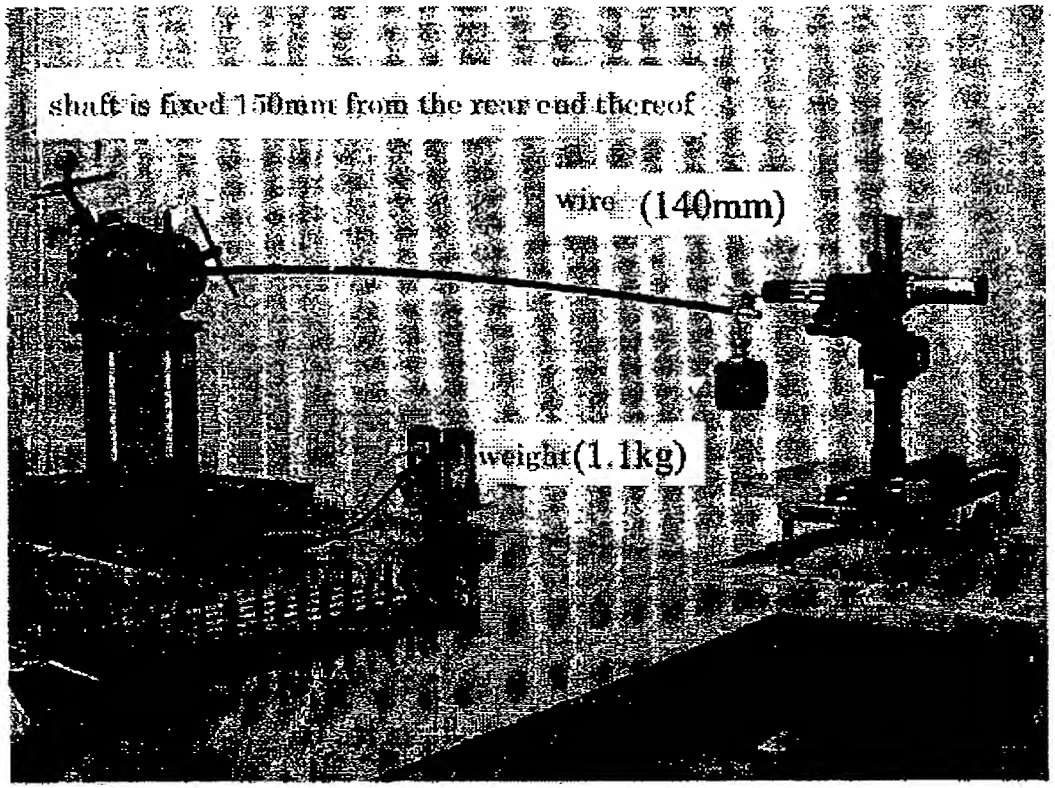
※ An arrow is shown a direction of load applied on the shaft.

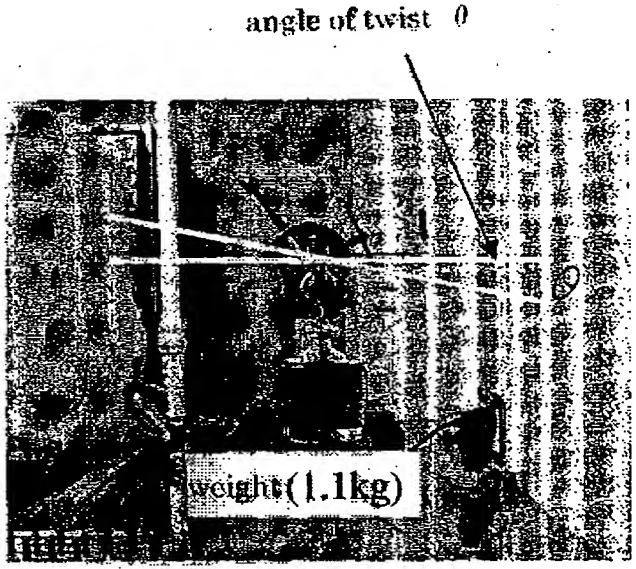
Fig. 2



※ An arrow is shown a direction of load applied on the shaft.

measurement of amount twist of shaft





view of front end of the shaft